UNITED STATES PATENT AND TRADEMARK OFFICE

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10/578,390	05/05/2006	Im Young Jung	CU-4805 WWP	1845

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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 March 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

The Examiner acknowledges the applicant's submission of the amendment dated 3/17/2008. At this point claims 1-13 have been amended and no claims have been added. Thus, claims 1-13 are pending in the instant application.

The instant application having Application No. 10/578,390 has a total of 13 claims pending in the application, there are 3 independent claims and 10 dependent claims, all of which are ready for examination by the examiner.

REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 6, 7, 10, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Engelstad et al (US 5,485,613) in view of Hasbun (US 5,640,529).**

Regarding Claim 1, Engelstad teaches a garbage data collection method comprising:

making a first list of objects to be deleted from a memory (the first list corresponds to unmarked objects in the condemned region, since the objects being unmarked means they are to be deleted from memory, Column 27 Lines 9-16);

calculating up to a predetermined time limit (see steps 410 and 412 in Figure 4,

where a comparison is made between the continually summed garbage collection tasks

and the time allotted to the garbage collector [this time corresponding to a

predetermined time limit]);

after the time limit calculation, deleting the listed objects of the first list from the

memory within the predetermined time ("the object is removed from the generation and

memory resources associated with the object are freed", Column 27 Lines 14-16, this is

done within the predetermined time since this is done during garbage collection), and

updating the first list of objects to list those undeleted objects of the first list which

remain after the lapse of the calculated residual time (the list is updated because the

freed object is removed from the generation [Column 27 Lines 14-16] and thus not

scanned again, so the unmarked objects in the condemned region [the first list] is

updated by removing these objects from the generation), and storing the updated first

list such that the objects in the updated first list are available for deletion in another

communication cycle (the unmarked objects remain in the generation of objects to be

deleted, also see Figure 4 of how after each task the garbage collector may be exited

and completed later [step 412] and how freeing an object is listed as a task, Column 27

Line 22).

However, while Engelstad teaches limiting the time in garbage collection, he

does not explicitly teach calculating a residual time after processing an external

command. Hasbun teaches calculating a residual time after a host executes a

command to execute cleanup, such as garbage collection (Figure 8 in Hasbun, also

Column 2 Lines 19-27). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to which the subject matter pertains to have calculated a residual time after an external command as in Hasbun and used that to determine when to enter and leave the garbage collector in the device of Engelstad (i.e., a comparison of the watchdog timer to a predetermined limit [as in Hasbun] replaces step 408 in Figure 4 of Engelstad and step 418 in Figure 8 of Hasbun replaces step 412 in Figure 4 of Engelstad). As motivation, Hasbun's residual cleanup method does not adversely affect the perceived performance of the device being garbage collected (Column 3 Lines 54-56 in Hasbun).

Regarding Claim 2, Engelstad and Hasbun teach all limitations of Claim 1, wherein the time limit is determined by a host that transmits the external command or the time limit is determined to be a period of time up to a time guaranteeing QoS that a user does not feel a response delay to the external command (Column 12 Line 24-25, where the cycle bound is 10 ms, a small enough amount that user would not feel a response delay).

Regarding Claim 3, Engelstad and Hasbun teach all limitations of Claim 1, wherein the act of making the first list is performed when a garbage collection is requested (the list is made during steps 1 through 7 of Column 13 Lines 33-41, and when these commands are entered [as in the "YES" branch of step 408 of Figure 4], garbage collection is requested by the processor).

Regarding Claim 6, Engelstad and Hasbun teach all limitations of Claim 1, wherein the act of deleting the objects of the first list comprises: making a second list of

objects to be deleted from the memory during any residual time remaining after all objects in the first list (the garbage collection process will move on from step 8 in Column 13 Line 41 to step 1 in Column 13 Line 33, which is the beginning of making a second list with a new condemned region).

Regarding Claim 7, Engelstad and Hasbun teach all limitations of Claim 1, further comprising deleting objects of an existing list of objects listing undeleted objects of a prior communication cycle before the external command is processed (since the steps listed in Column 13 Lines 33-41 are repeated, an existing list of objects will be deleted [as in step 8, "garbage reclamation"] at some point before processing the external command).

Claim 10 is the apparatus analogous to the method of Claim 1, and is rejected under similar rationale.

Claim 13 is the computer readable medium recorded thereon a computer readable program analogous to the method of Claim 1, and is rejected under similar rationale.

Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engelstad and Hasbun in further view of Serlet (US 5,355,483).

Regarding Claim 4, Engelstad teaches all limitations of Claim 1 as discussed above. However, Engelstad and Hasbun do not teach adding an object to the list of objects if that object had been earmarked in a prior communication cycle. Serlet teaches a way of listing object references in a memory such that all new objects in memory (thus including ones that have not been deleted before) are added to a list of

ones to be marked for garbage collection (see Figure 7 in Serlet and "adding" step 706

in particular). It would have been obvious to a person of ordinary skill in the art at the

time the invention was made to which the subject matter pertains to have used the

method of garbage collection in Figure 7 of Serlet instead of the way described by

Engelstad, since using Serlet's method enables garbage collection to be "performed

automatically without requiring that the ongoing processing steps of the user processor

be halted during the garbage collection process" (Column 6 Lines 32-35 in Serlet).

Regarding Claim 5, Engelstad and Hasbun teach all limitations of Claim 1, but

do not teach updating the list when an object is newly generated or deleted. Serlet

teaches if an object is newly generated or deleted during the command processing,

updating the list of objects to be deleted (note that when garbage collection begins, the

state machine described in Figure 7 of Serlet will make the list, and since the command

is run as part of the garbage collection process of Engelstad, the list of objects to be

deleted is updated when the command newly generates or deletes an object). It would

have been obvious to a person of ordinary skill in the art at the time the invention was

made to which the subject matter pertains to have used the method of garbage

collection in Figure 7 of Serlet instead of the way described by Engelstad, since using

Serlet's method enables garbage collection to be "performed automatically without

requiring that the ongoing processing steps of the user processor be halted during the

garbage collection process" (Column 6 Lines 32-35 in Serlet).

Claims 8, 9, 11, and 12 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Engelstad and Hasbun in view of Wells et al (US 5,740,395).

Regarding Claim 8, Engelstad and Hasbun teaches all limitations of Claim 1 as

discussed above. However, Engelstad and Hasbun do not teach performing together a

memory write command and object delete command. Wells teaches if the command

includes a memory write command or an object delete command (the command is a

memory write, see Column 19 Lines 21-23 and Figures 12A and 12B in Wells), and if

there is a list of objects to be deleted from the memory before the write or delete

command is processed, concurrently performing the deleting of the objects and the

write or delete command (Column 19 Lines 43-51 in Wells). It would have been obvious

to a person of ordinary skill in the art at the time the invention was made to which the

subject matter pertains to have performed the memory write command with the object

delete command since this allows the device to maintain minimum memory reserves

(Column 19 Lines 43-46 in Wells). Thus, by combining the devices, the additional

benefit of maintaining memory reserves necessary for proper performance is obtained.

Regarding Claim 9, Engelstad and Hasbun teach all limitations of Claim 1 as

discussed above. However, Engelstad and Hasbun do not teach simultaneously

deleting consecutively existing objects in memory, nor does he teach concurrently

performing the allocating and deleting of a memory block if memory space to be

allocated for an object and memory space of objects to be deleted are consecutive

memory spaces or the same memory space. Wells teaches simultaneously deleting

consecutively existing objects in memory (note how blocks are cleaned up in their

entirety, thus the sectors consecutively existing in memory are cleaned up simultaneously, see Column 21 Lines 50-55 in Wells). Wells also teaches allocating and deleting a memory block concurrently (Column 21 Lines 50-67 in Wells, note how the block is freed and a new block is selected, and that this new block is likely to be the block that was just freed since the criteria for choosing a block from the 5 Rules for choosing a block described by Wells have not changed substantially). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to which the subject matter pertains to have used these teachings of simultaneously deleting consecutive objects in consecutive memory space and simultaneously deleting a memory space and allocating the memory space because doing so is much faster than not performing the actions concurrently. Thus, by combining the devices, one of ordinary skill in the art would realize that the benefit of a faster device is obtained.

Claim 11 is the apparatus analogous to the method of Claim 7, and is rejected under similar rationale.

Claim 12 is the apparatus according to the method of Claim 8, and is rejected under similar rationale.

ARGUMENTS CONCERNING NON-PRIOR ART REJECTIONS/OBJECTIONS

Drawing Objections

Applicant's arguments/amendments with respect to the drawings have been considered and have overcome the Examiner's prior objections and thus are withdrawn.

Specification Objections

Applicant's arguments/amendments with respect to the specification have been considered and have overcome the Examiner's prior objections and thus are withdrawn.

Rejections - USC 112

Applicant's arguments/amendments with respect to claims 8, 9, and 12 have been considered and have overcome the Examiner's prior rejections and thus are withdrawn.

ARGUMENTS CONCERNING PRIOR ART REJECTIONS

Rejections - USC 102/103

Applicant's arguments with respect to claims 1, 10, and 13 (and their dependent claims) regarding Hasbun having no list of objects to be deleted has been considered but is moot in view of the new grounds of rejection.

Applicant's arguments with respect to Claims 1, 10, and 13 (and their dependent claims) regarding Hasbun not updating or storing the list has been considered but is moot in view of the new grounds or rejection.

RELEVANT ART CITED BY THE EXAMINER

The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant's art and those arts considered reasonably pertinent to applicant's disclosure. See **MPEP 707.05(c)**.

The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure. These references include:

CLOSING COMMENTS

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

STATUS OF CLAIMS IN THE APPLICATION

The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. ' 707.07(i)**:

CLAIMS REJECTED IN THE APPLICATION

Per the instant office action, claims 1-13 have received a second action on the merits and are subject of a second action final.

DIRECTION OF FUTURE CORRESPONDENCES

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Anthony Giardino whose telephone number is (571) 270-3565 and can normally be reached on Monday - Thursday 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Sanjiv Shah can be reached on (571) 272 - 4098. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M.A. Giardino

/M.G./

Patent Examiner
Art Unit 2185

June 18, 2008

/Sanjiv Shah/

Supervisory Patent Examiner, Art Unit 2185